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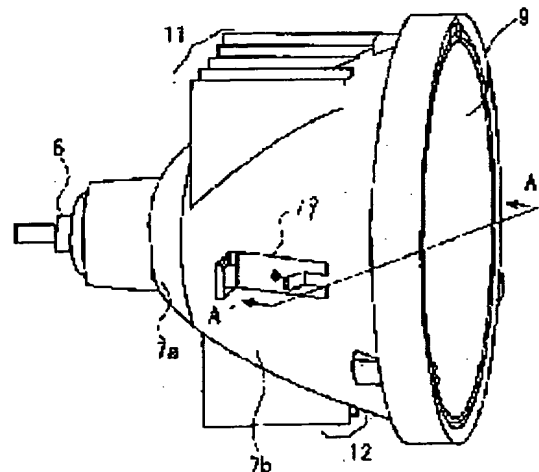
## (54) LIGHT SOURCE FOR PROJECTOR AND PROJECTION TYPE IMAGE DISPLAY DEVICE USING IT

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a light source for a projector, capable of substantially increasing a quantity of light flux effectively taken out from a lamp forming a light source, and excellent in workability with high precision.

SOLUTION: This light source for a projector is provided with an arc tube 6 and a reflector 7 equipped with a concave reflecting surface to reflect light emitted from the arc tube and to emit it in its optical axis direction while holding the arc tube, and the reflector is provided with a first reflector 7a disposed in the vicinity of a holding part to hold the arc tube and a second reflector 7b disposed at a part other than the holding part and formed by containing a material different from the first member. In addition, the first reflector 7a is formed by a material containing heat-resisting glass, and the second reflector 7b is formed by a heat-resisting organic material having a lower thermal deformation temperature than the heat-resisting glass.

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CLAIMS

[Claim(s)]

[Claim 1] The arc tube which is the light source for projection equipments for irradiating light at a display device, and emits light, It has the lieberkuhn which has the reflector of the shape of a concave surface for reflecting the light from said arc tube and carrying out outgoing radiation from the opening, including the attaching part holding said arc tube. Said lieberkuhn It has the 2nd reflector containing the 1st reflector containing said attaching part divided in the field which intersects perpendicularly with the optical axis of this lieberkuhn, and said opening. It is the light source for projection equipments characterized by forming said 1st reflector using the 1st construction material, and forming said 2nd reflector using the 2nd construction material with heat deflection temperature lower than this 1st construction material.

[Claim 2] It is the light source for projection equipments according to claim 1 which said 1st construction material is heat-resisting glass, and is characterized by said 2nd construction material being a heat-resistant organic material with heat deflection temperature lower than this heat-resisting glass.

[Claim 3] Said 2nd reflector is the light source for projection equipments according to claim 1 to which two or more projections are prepared in the outside surface at least, and this projection is characterized by being formed with the heat-resistant organic material with which the high temperature conduction matter was mixed.

[Claim 4] Said two or more projections are the light source for projection equipments according to claim 1 characterized by for each being tabular and the longitudinal direction being the direction wind from a cooling fan and abbreviation parallel which cool said light source for projection equipments.

[Claim 5] Said 2nd construction material is the light source for projection equipments according to claim 1 characterized by mixing a thermoplastic polymer, a curing agent, a bulking agent, a glass fiber, and an inorganic filler to a low contraction unsaturated polyester resin, and mixing a hydroxylation alumina.

[Claim 6] Said 1st construction material is the light source for projection equipments according to claim 1 characterized by coefficient of linear expansion being heat resisting glass below  $50 \times 10^{-5}$  ( $1 / K^{-1}$ ).

[Claim 7] It is the light source for projection equipments which is the light source for projection equipments for irradiating a display device, is equipped with the arc tube which emits light, and the lieberkuhn which has the reflector of the shape of a concave surface which reflects the light from this arc tube and carries out outgoing radiation to the opening, and is characterized by said lieberkuhn considering as the structure which can be divided into at least two at a flat surface almost parallel to the optical axis of this lieberkuhn.

[Claim 8] Said lieberkuhn is the light source for projection equipments according to claim 7 characterized by forming a glass front in the opening.

[Claim 9] The light source for projection equipments according to claim 7 characterized by the configuration of the reflector of said lieberkuhn being expressed by the bottom type.

[Equation 1]

$$Z(r) = (1/RD) \cdot r^2 \left[ 1 + \sqrt{1 - (1 + CC) \cdot r^2 (1/RD)^2} \right] \\ + AE \cdot r^4 + AF \cdot r^6 + AG \cdot r^8 + AH \cdot r^{10} + \dots + A \cdot r^n$$

— (数1)

However, the height of the reflector at the time of taking radial [ of the reflecting mirror which intersects perpendicularly the arc shaft orientations of said arc tube including the focus of said reflector with said Z-axis for the Z-axis ] on r shaft is expressed, r shows a radial distance, and Z (r) is RD, CC, AE, AF, AG, AH, —, A. n shows the natural number of arbitration for the constant of arbitration.

[Claim 10] It is the light source for projection equipments according to claim 7 characterized by having located the light center of said arc tube in the abbreviation focal location of said lieberkuhn, and having carried out abbreviation coincidence of the arc shaft of said arc tube on the optical axis of said lieberkuhn, having fabricated said reflecting mirror with the heat-resistant organic material which mixed the high temperature conduction matter, and enlarge pars-basilaris-ossis-occipitalis average wall thickness of said reflecting mirror compared with the average wall thickness of the flux of light outgoing radiation section.

[Claim 11] Said arc tube is the light source for projection equipments according to claim 7 characterized by for an inter-electrode distance of a couple which a xenon or mercury was enclosed at least and prepared in the ends within [ this ] luminescence being 1.8mm or less, and being the short arc mold discharge lamp with which the rated power is turned on less than [ 250W ], and the focal distance of said lieberkuhn being 4mm or more.

[Claim 12] Said 2nd reflector is the light source for projection equipments according to claim 1 which it can divide into at least two at a flat surface almost parallel to the optical axis of said lieberkuhn, is the parting plane, and is characterized by holding on both sides of the power line for supplying power to said arc tube from said lieberkuhn exterior.

[Claim 13] This mounting accessory plate is the light source for projection equipments according to claim 12 characterized by being arranged in the front face by the side of the flux of light outgoing radiation of said lieberkuhn including a mounting accessory plate for said 2nd reflector to attach said light source for projection equipments in a position.

[Claim 14] It has the fixing metal for fixing said 1st reflector and said 2nd reflector. This 2nd reflector It has the boss for immobilization in whom these mounting fixed metallic ornaments and association are possible. This fixing metal The elastic member for contacting said 1st reflector and pressing down to said 2nd reflector, When it has the plate-like part material which inclined to the direction of flux of light outgoing radiation and hard flow of said lieberkuhn and said fixing metal is combined with said boss for immobilization, while forcing said 1st reflector on said 2nd reflector and fixing with the elasticity which said elastic member has The light source for projection equipments according to claim 1 characterized by making as [ lead / the wind generated with the cooling fan for cooling said light source for projection equipments / by said plate-like part material / so that it may flow along the outside surface of this lieberkuhn in said direction of an attaching part from the opening side of said lieberkuhn ].

[Claim 15] Said 2nd reflector is the light source for projection equipments according to claim 1 characterized by making as [ fix / have the pawl for two or more hooks extended to the direction of said 1st reflector, / by this pawl, / hook this \*\* reflector on this reflector, and ].

[Claim 16] To either of said 1st and 2nd reflectors, two or more convex projections Establish the concave hole which makes this projection and a pair in another side, insert in the projection and concave hole of this couple mutually, and alignment of said 1st reflector and 2nd reflector is carried out. The light source for projection equipments according to claim 1. characterized by combining both so that a gap may be formed between said 1st reflector and 2nd reflector through said projection.

[Claim 17] The light source for projection equipments according to claim 16 to which the clearance between said 1st reflector and said 2nd reflector is characterized by being for 0.05 to 2mm where said projection and said concave hole are inserted in.

[Claim 18] The light source for projection equipments according to claim 17 to which a pair of

number of said projections and said concave holes is characterized by being at least three pieces.

[Claim 19] The light source for projection equipments according to claim 1 characterized by forming two or more irregularity in the external wall surface of said \*\* and the 2nd reflector.

[Claim 20] The light source for projection equipments according to claim 1 to which a diameter is characterized by preparing hair transplantation of a 0.1 to 0.3mm synthetic fiber by die length by 30 to 50 micrometers in the external wall surface of said 2nd member.

[Claim 21] The light source for projection equipments according to claim 1 characterized by combining said 1st reflector and said 2nd reflector removable.

[Claim 22] The light source for projection equipments according to claim 1 characterized by coloring this 2nd reflector by 0.5 or less color by 0.7 or less emissivity or abbreviation 400K when the metal thin film is given to the reflector of said 2nd reflector.

[Claim 23] The light source for projection equipments according to claim 22 characterized by coloring said 2nd reflector in white.

[Claim 24] Are the light source for projection equipments for irradiating light at a display device, and it has the lieberkuhn equipped with the reflector of the shape of a concave surface which reflects the light emitted from the arc tube which emits light, and this arc tube, and carries out outgoing radiation in the direction of an optical axis. The reflective film is formed in the front face of this reflecting mirror. This reflective film The light source for projection equipments to which the vertical permeability to the beam of light of the wavelength from 420nm to 700nm is 15% or less, and the vertical permeability to a beam of light with a wavelength of 410nm or less is characterized by the vertical permeability to a beam of light with a wavelength of 800nm or more having 50% or more of property at 50% or more.

[Claim 25] The light source for projection equipments according to claim 1 which a reflection factor [ as opposed to light with a wavelength of 450 to 650nm in the reflective film given to the reflector of said 2nd reflector ] is 95% or more, and is characterized by being formed by silver with the reflection factor of 650nm higher than the reflection factor of 450nm, or the single-level-metal film of a silver alloy.

[Claim 26] The light source for projection equipments for emitting light, and the display device to which incidence of the light from this light source for projection equipments is carried out, and it modulates this incident light according to an input picture signal, In the projection mold image display unit equipped with the projection lens which expands the light modulated by this display device and is projected on a screen said light source for projection equipments It has the lieberkuhn which has the reflector of the shape of a concave surface for reflecting the light from said arc tube and carrying out outgoing radiation from the opening, including the attaching part holding the arc tube which emits light, and said arc tube. Said lieberkuhn was divided in the field which intersects perpendicularly with the optical axis of this lieberkuhn. It has the 2nd reflector containing the 1st reflector containing said attaching part, and said opening, and said 1st reflector is formed using the 1st construction material. Said 2nd reflector The projection mold image display unit characterized by being formed using the 2nd construction material with heat deflection temperature lower than this 1st construction material.

[Claim 27] The projection mold image display unit which is a projection mold image display unit equipped with the light source stowage which has the structure of which receipt fetch of the light source case and this light source case where the light source for projection equipments for irradiating light and this light source for projection equipments are stored in a display device is made free, and is characterized by for die length to be equipped with hair transplantation of a 0.1 to 0.3mm synthetic fiber by the diameter by 30 to 50 micrometers at the internal surface of this light source case.

[Claim 28] Said light source case is a projection mold image display unit according to claim 27 characterized by having had the hand hold for taking out this light source case from said light source stowage outside further, and for a diameter being 30 micrometers to 50 micrometers, and die length preparing hair transplantation of a 0.1 to 0.3mm synthetic fiber in the \*\*\*\* outside surface with picking of this hand hold.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to amelioration of the reflecting mirror (reflector) applied to the light source for projection equipments, such as liquid crystal projector equipment and an overhead projector.

[0002]

[Description of the Prior Art] Conventionally, what combined the reflector which reflects and emits the light from an arc tube and its arc tube as the light source for projection equipments, such as liquid crystal projector equipment and an overhead projector, is used. As an arc tube, a metal halogenide is enclosed within luminescence and the short arc type metal halide lamp using luminescence peculiar to the metal with a short inter-electrode distance is used. Moreover, as a reflector, the reflector which carried out the coat of the multilayer of titanium oxide or diacid-ized silicon to the internal surface of heat resisting glass is used. Then, change to a metal halide lamp and an extra-high pressure mercury lamp with an easy raise in brightness and a xenon lamp with high \*\*\*\*\* should come to be used widely. Especially, the extra-high pressure mercury lamp has improved luminous efficiency by raising the vapor pressure of the mercury under burning to 120 or more atms, and has realized high brightness-ization. Furthermore, the spectral-distribution property has been improved by mixing the additive other than mercury, and high \*\*\*\*\* is realized.

[0003] However, when this extra-high pressure mercury lamp has the narrow optimal operating temperature limits and they separate from it and use it from the design optimal range, it has the trouble that decline in luminous efficiency and the life of a lamp bulb become short.

[0004] The reflector used for this light source for projection equipments carried out press forming of the heat-resisting glass with a small coefficient of thermal expansion, carried out the coat of the vacuum evaporatio film of the aluminum whose reflection factor is about 90% to the reflector wall after that, and was further obtained by performing antioxidizing processing to the front face of said aluminum vacuum evaporatio film.

[0005] In recent years, the optical multilayer which consists of TiO<sub>2</sub> and SiO<sub>2</sub> from which a higher reflection factor is obtained by the commercial-scene demand of the further raise in brightness as reflective film of a reflector inner surface compared with the aluminum vacuum evaporatio film is used. As for the flux of light which carries out outgoing radiation from this reflector, it is common to consider as parallel or the convergence flux of light. According to this, the configuration of a reflector reflector has a paraboloid or an ellipsoid in use.

[0006] Drawing 1 is a sectional view as the general light source for projection equipments which made the extra-high pressure mercury lamp the source of luminescence. In the arc tube of power consumption 100W class, the content volume of the arc tube 1 made from quartz glass is 55microl, sealing of the electrode 2 is carried out to ends, and the arc length in the meantime is set as about 1-1.4mm. and -- the interior of an arc tube 1 -- the hydrogen bromide is contained [ as photogene ] for mercury at a rate of the amount of conventions to the argon with the argon as start-up auxiliary gas. The molybdenum foil 4 is welded to the electrode mandril 3, and the electrode closure section 5 is formed. The electrode mandril 17 is attached in the electrode

closure section 5 by the side of reflector opening at the molybdenum foil 4, and lead wire 18 connects with the lead-wire metallic ornaments 19 which are one power-source seal-of-approval terminals. Moreover, the mouthpiece 6 used as the power-source seal-of-approval terminal of another side is attached in the electrode closure section 5 by the side of reflector pars-basilaris-ossis-occipitalis opening. Adhesion immobilization of this mouthpiece 6 is carried out through cement 8 at the pars basilaris ossis occipitalis of a reflector 7 form [ pars basilaris ossis occipitalis ] the multilayer reflective film in an inner surface, reflect [ pars basilaris ossis occipitalis ] the light, and it was made to pass an infrared light line. Under the present circumstances, it is fixed to the abbreviation focal location of a reflector so that the arc shaft of an arc tube 1 may be located. And a part for the flange of front opening of this reflector 7 is used, and fitting of the front sheet glass 9 which has the almost same coefficient of thermal expansion as a reflector 7 is carried out. This front sheet glass 9 aims at scattering prevention of the arc tube at the time of an arc tube exploding, and antireflection coating is performed to those both sides.

[0007] Drawing 2 shows an activity gestalt in case the light source for projection equipments as shown in drawing 1 is used as the light source of optical instruments, such as actual liquid crystal projector equipment and an overhead projector. The fan 10 for cooling is installed in the side face or rear face of the light source for projection equipments. And the desired cooling effect is acquired by spraying the wind from this fan 10 for cooling on a reflector 7. The flow of air is made from sucking out the air of the light source circumference warmed by switching on the light as other approaches, and a reflector 7 is cooled.

[0008] As a means to modulate the reinforcement of the illumination light used as uniform distribution by the illumination-light study system using these light sources for projection equipments, the image display component which has arranged pixels, such as a liquid crystal panel and DMD (Digital Micro MirrorDevice), in the shape of a matrix is used. A picture signal is inputted into this image display component from a television signal or a computer, and an image is displayed on that screen. Amplification projection of this modulated light by which the light from the light source for projection equipments is modulated with the display image on said image display component is carried out with a projection lens. What projects this expanded light on the screen of another \*\* is called projection mold image projector equipment, and is equipped with a screen, projects the \*\*\*\*\* (ed) light from a screen tooth back, and copies out an image is called the so-called rear type of projection mold image display unit, and has spread through a commercial scene widely.

[0009]

[Problem(s) to be Solved by the Invention] The reflector currently used for the light source for projection equipments by the conventional technique expressed above had acquired the desired configuration by carrying out press forming of the heat resisting glass. This heat resisting glass is lacking in a fluidity compared with resin, and when carrying out press forming of the heat-resisting glass, temperature management and weight management of a raw material are difficult for it, and since it cannot use big warm water or the oil of the specific heat for the temperature control of metal mold, it is deficient in configuration stability compared with general thermoplasticity or a thermosetting plastic ingredient.

[0010] Drawing 12 is structural drawing of 2 division reflector in which the cross-section configuration of a reflector shows the condition of the cross-section configurations of reflector 7j of an ellipse and a reflector having joined reflector 7k (diameter depth of 100mm of 116mm (reflector radius of 54mm)) of a circle, and having joined with cement the mouthpiece 6 of the arc tube 1 which is a source of luminescence to reflector 7j. In drawing 12, the same sign is given to the part same to drawing 1, and explanation is omitted.

[0011] In order to check the configuration precision of the reflector used for the light source for projection equipments, when reflector 7k which carries out press forming of the heat-resisting glass, and is shown in drawing 12 was made as an experiment, shaping precision (error from a design configuration) exceeded 700 micrometers, and in reflector opening, though it was the metal mold of three draft, it became a vertical plane mostly by contraction of mold goods, and mold releasability worsened. Consequently, the engine performance for which mold goods deform



into a saddle type 1300 micrometers, and are satisfied with it of the engine performance was not able to be obtained.

[0012] thus, the diameter which carried out press forming of the conventional heat-resisting glass exceeds 90mm -- comparatively -- a large -- an aperture reflector -- setting -- a moldability (imprint nature and repeatability of metal mold) -- a problem -- it is -- the configuration of an inner surface -- a monotonous ellipse or a monotonous paraboloid -- not carrying out -- it did not obtain but there was the 1st trouble referred to as being unable to acquire stably the highly precise reflector configuration near a design configuration in the reflector made from heat-resisting glass by the conventional technique.

[0013] Furthermore, since the reflector of the conventional technique by heat-resisting glass is fabricated with a press, it extracts in the case of taking out the product from metal mold, and a direction is limited to a vertical 2-way. For this reason, there is also the 2nd problem that it cannot complicate a configuration that a concavo-convex configuration cannot be prepared in the external wall surface of a reflector etc.

[0014] It is in offering the light source for projection equipments equipped with the reflector which it succeeded in this invention in view of the technical problem in the above-mentioned conventional technique, and the object was highly precise, was excellent in a moldability and workability, and was excellent also in the heat-resistant property and the reflection property, and projection equipment equipped with it.

[0015]

[Means for Solving the Problem] In order to attain the above-mentioned object, in this invention, it is characterized by configuration which was indicated to claim 1. That is, it constituted from the 1st reflector containing the attaching part holding an arc tube divided in the reflector in the field which intersects perpendicularly with the optical axis of this reflector, and the 2nd reflector in which light contains opening by which outgoing radiation is carried out, said 1st reflector was formed using the 1st construction material of heat-resisting glass etc., and said 2nd reflector was formed using the 2nd construction material with heat deflection temperature lower than this 1st construction material.

[0016] In the reflecting mirror part which furthermore used the heat-resistant organic material, the heat produced when preparing projections, such as a radiation fin, in the reflecting mirror outside surface and a bulb is turned on, as indicated to claims 3 and 4 is transmitted to the radiation fin through the high temperature conduction matter mixed in the interior of a reflecting mirror. Heat is transmitted outside efficiently by this and cooling effectiveness can be raised. If the installation direction of this radiation fin is attached in parallel at the flow of the wind generated by the fan for cooling, it can radiate heat very efficiently.

[0017] Moreover, as shown in claim 7, it becomes possible to acquire the reflector configuration where a design degree of freedom is more large by considering as the structure in which at least 2 division is possible at a flat surface almost parallel (an optical axis is included) to the optical axis of a reflector (especially the 2nd reflector).

[0018] Concretely as an usable heat-resistant organic material To a low contraction unsaturated polyester resin, a thermoplastic polymer, a curing agent, a bulking agent, A glass fiber and an inorganic filler are mixed. And as shown in claim 7, in order to raise thermal conductivity Since the mold goods obtained by fabricating the thermosetting resin (Following BMC (Bulk Molding Compounds) and description) which mixed the hydroxylation alumina can realize temperature management of a weight management metallurgy mold and a raw material to high degree of accuracy A high configuration precision is not only acquired, but it excels in shaping stability.

[0019] For this reason, as shown in claim 9, even if it becomes a complicated configuration containing the high order multiplier of an aspheric surface type from a conventional ellipse or a conventional paraboloid about the configuration of a reflector inner surface, a highly precise reflector can be acquired. A reflector is fabricated with a heat-resistant organic material, and a highly precise reflector is obtained by mixing the high temperature conduction matter further.

[0020] Furthermore, as indicated to claim 24, the property of making the beam of light of an ultraviolet region 410nm or less penetrating is given to the reflective film formed in the reflector of a reflector again. At this time, it is lost by adding an ultraviolet ray absorbent to said

thermosetting resin that harmful ultraviolet rays leak outside from a reflector. It is made to also pass simultaneously the beam of light of a near infrared region 800nm or more as a property of the reflective film furthermore. Consequently, since a heat ray (from near-infrared to infrared light) is absorbed by the reflector, the temperature rise of the components contained in projection equipment is mitigated, and reinforcement becomes possible. Simultaneously, if the permeability of a beam of light is made to 15% or less from 420nm to 700nm among light fields, a reflector with high effectiveness can be obtained.

[0021] Moreover, like, a projection is prepared in either of the 1st and 2nd reflectors, the hole according to claim 16 which makes this projection and pair is established in another side, the projection and hole of this couple are inserted in mutually, alignment is carried out, and both are fixed so that a gap may be formed between the 1st reflector and the 2nd reflector through this projection. If it does in this way, the touch area of the 1st reflector and the 2nd reflector becomes small, and heat conduction from the 1st reflector holding an arc tube to this 2nd member can be reduced. Therefore, a margin [ as opposed to the allowable temperature of for example, a heat-resistant organic material for the ingredient used for the 2nd reflector ] can be enlarged. At this time, it is desirable to set the clearance between said 1st reflector and said 2nd reflector to 0.05 to 2mm, where a projection and a hole are inserted in, and to make a pair of number of a projection and holes into at least three pieces so that it may indicate to claims 17 and 18. Thus, while reducing heat conduction from the 1st reflector to the 2nd reflector by the air space of a clearance by constituting, the convection heat inside the light source can be emitted from this gap. Moreover, a stable contact back face is securable with three-point contact support.

[0022] Furthermore, die length may prepare [ a diameter ] hair transplantation of a 0.1 to 0.3mm synthetic fiber in the external wall surface of said 2nd reflector by 30 to 50 micrometers like the publication to claims 27 and 28. Thus, if constituted, while enlarging surface area on the front face of an outer wall and improving heat dissipation, it is effective in the ability to reduce the risk of a burn by the air space by hair transplantation, even if it touches an outer wall.

[0023] Moreover, as for the metal mold for BMC, it is possible to make metal mold slide from plurality, such as a side core and a vertical slide core, and a good moldability is obtained also in a complicated appearance configuration.

[0024] If the light source for projection equipments of a configuration of having stated above is used for projection mold image projector equipment or a rear type projection mold image display unit, the condensing effectiveness of a lamp will improve and it will become possible to obtain a bright good image.

[0025]

[Embodiment of the Invention] Hereafter, the gestalt of desirable operation of this invention is explained using a drawing. this invention person etc., "in order to solve the technical problem of this invention explained previously, it has already applied for the application for patent 2001-114763. As a base material of a reflector, this invention is changed to heat-resisting glass, and it can make shaping precision over a design configuration very high using a heat-resistant organic material, securing heat-resistant ability.

[0026] Hereafter, an example describes the content first. In order to check the configuration precision of the reflector used for the light source for projection equipments, the spherical-surface reflector (diameter depth of 100mm of 116mm (reflector radius of 54mm)) of the configuration shown in 7k of drawing 12 mentioned above was made as an experiment by Showa High Polymer Co., Ltd. RIGORAKKU BMC (RNC-428) which is a heat-resistant organic material. Consequently, the amount of gaps from a design configuration was about 10 micrometers of maxes, by making the high-degree-of-accuracy temperature control and weight management precision of metal mold into 0.5% or less, set lot-to-lot dispersion to 3 micrometers or less, and was able to carry out the thing of it. Furthermore, since BMC was excellent in the mold-release characteristic also in the field where a shaping side is almost vertical, it has the imprint nature which was [ become / the draft (liminal gradient required in case mold goods are sampled from metal mold) / almost unnecessary ] excellent, and was able to acquire stably the reflector configuration of the highly precise reflector near a design configuration. In addition, Above BMC

omits BulkMolding Compounds.

[0027] As for the metal mold for BMC, it is possible to make metal mold slide from plurality, such as a side core and a vertical slide core, and since a good moldability is obtained also in a complicated appearance configuration, it prepares the fin for heat dissipation in the outer wall of a reflector, and has the advantage which can raise thermal resistance with this radiation fin.

[0028] In addition to the check of the above-mentioned configuration precision, further, AL (aluminum) was vapor-deposited inside, it considered as the reflector, and the temperature of the reflector at the time of making a reflector with a focal distance of 30mm fix and turn on the extra-high pressure mercury lamp of 200W and a reflector external wall surface was measured. Consequently, it set calm at the room temperature of 20 degrees C, and the temperature of 132 degrees C and a reflector external wall surface is 83 degrees C, and the temperature of a reflector obtained the prototype result with the ability of about 70-degree C margin to be taken [ good ] to the heat deflection temperature of 200 degrees C of an ingredient.

[0029] However, when taking into consideration the distance to the bulb and reflector internal surface of an arc tube, with the focal distance of 4mm or less, it pointed out that thermal resistance posed a problem since the margin to heat-resistant temperature is lost, and the margin to heat-resistant temperature is lost even if input power exceeds 250W.

[0030] The 1st operation gestalt of this invention for solving this is explained using drawing 3 and drawing 4. Drawing 3 is the reflector which shows the 1st operation gestalt of this invention, and consists of at least two parts (the 1st and 2nd reflectors) formed from the ingredient with which at least two kinds of heat deflection temperature differs. The reflector of this operation gestalt is divided in the field which intersects perpendicularly with the optical axis of a reflector, and is characterized by changing construction material bordering on this parting plane. Drawing 4 is the AA' sectional view of the reflector in the operation gestalt of the invention in this application 1st shown in drawing 3. In addition, in drawing 3 and drawing 4, the same sign is given to the part same to drawing 1, and explanation is omitted.

[0031] Since it becomes an elevated temperature near the bulb of the arc tube 1 which is a heat source (the attaching part holding an arc tube 1, and its perimeter), it is referred to as 1st reflector 7a of the diameter of a header using heat-resisting glass (heat deflection temperature about 500-600 degrees C) with high heat deflection temperature. As everyone knows, if it is 60mm or less in diameter also in the reflector made from heat-resisting glass, the configuration precision of about 50 micrometers is realizable. Under the present circumstances, as for the coefficient of linear expansion of the heat-resisting glass to be used, it is desirable to carry out in consideration of destruction by thermal expansion to below  $50 \times 10^{-5}$  (1 / K-1).

[0032] Moreover, as for 2nd reflector 7b of the part separated from the bulb of an arc tube in the direction of luminous radiation, it is desirable for temperature to have mixed the thermoplastic polymer as a low contraction agent, the curing agent, the bulking agent, the glass fiber, the inorganic filler, etc. to the low contraction unsaturated polyester resin which is a heat-resistant organic material since it is low, and to have improved thermal resistance (heat deflection temperature of about 200-250 degrees C), for example, to fabricate using Showa High Polymer Co., Ltd. RIGORAKKU BMC (RNC-428) etc. The reflector of a high shaping precision can be obtained by carrying out like this. RNC-428 use the calcium carbonate as a filler and a property with the as good thermal conductivity as 0.5 W/m-k" is acquired. the company make which mixed the hydroxylation alumina as a filler as an ingredient which aimed at much more improvement in thermal conductivity -- thermal conductivity is 0.8 W/m-k" and RNC-841 are about 1.6 times RNC-428.

[0033] As mentioned above, a reflector is constituted from an ingredient with which at least two kinds of heat deflection temperature differs, and the ingredient with a high shaping precision is used for the part (2nd reflector 7b) containing opening which emits light for an ingredient with heat-resistant high temperature to the part holding an arc tube, or the part (1st reflector 7a) near it. Thereby, the above-mentioned trouble is solvable. In addition, 1st reflector 7a and 2nd reflector 7b are being fixed by the fixed approach which is not illustrated. About the structure and the approach of detailed immobilization, it mentions later.

[0034] In drawing 3, the fins 11 and 12 for heat dissipation are formed in the upper part and the

lower part of an external wall surface of 2nd reflector 7b using a heat-resistant organic material. Since a good moldability is obtained also in a complicated appearance configuration as mentioned above, a heat-resistant organic material can arrange the fin for heat dissipation, and can obtain the more excellent heat dissipation engine performance.

[0035] Drawing 5 , drawing 6 , and drawing 7 show the 2nd operation gestalt of this invention. The reflector is made into the structure (in drawing 5 , it sets to 7e, 7f, and drawing 7 in 7d, 7c, and drawing 6 , and they are 7g and 7h) which it had 2 \*\*\*\*s at the flat surface including the optical axis of a reflector. As drawing 3 and drawing 4 described, as for each part carried out 2 \*\*\*\*s at the flat surface including the optical axis of a reflector, it is desirable to consist of a part of the reflector using heat-resisting glass and a reflector part using a heat-resistant organic material. However, in a real activity, as long as it comes to obtain sufficient margin to heat deflection temperature, one kind of ingredient, for example, a heat-resistant organic material, may be used for each part carried out 2 \*\*\*\*s at the flat surface including the optical axis of a reflector.

[0036] In drawing 5 , share-ization of metal mold is attained by making a reflector into a configuration symmetrical with the upper and lower sides, and effectiveness is in the cost reduction at the time of mass production. Furthermore, heat dissipation effectiveness can be further raised with adding the same fin 12 for heat dissipation also as reflector 7c to the lower part besides the fin 11 for heat dissipation prepared in the upper part of a reflector 7d external wall surface.

[0037] Drawing 6 has added the same fin 15 for heat dissipation also as the lower part and reflector 7f besides the fin 14 for heat dissipation prepared in the upper part of the external wall surface of reflector 7e. The difference from the gestalt of operation shown in drawing 5 is the point that the direction in which the fin is prepared is vertical to the optical axis of a reflector. Depending on the direction wind (a fan's installation location) which cools a reflector, heat dissipation effectiveness can be gathered further.

[0038] Furthermore by drawing 7 , the heat dissipation engine performance which was further excellent in the fin 14 for heat dissipation forming a radiation fin 16 (not shown [ the radiation fin of a right-hand side external wall surface ]) for the fin 15 for heat dissipation also to the lower part of a reflector 7h external wall surface also in right and left of an external wall surface can be obtained in the upper part of a reflector 7g external wall surface by setting a symmetry axis as the shaft of a lamp bulb. In addition, the same sign is given to the part same to the forward release of drawing by drawing 5 , drawing 6 R> 6, and drawing 7 , and explanation is omitted.

[0039] In addition, although [ drawing 5 , drawing 6 , and drawing 7 ] a reflector is divided into two at a flat surface including the optical axis of a reflector, it is not limited to this. Two or more \*\*\*\*s of essence of this invention, for example, you may quadrisect, are clear by dividing at the flat surface which attains share-ization of metal mold, is to reduce the cost at the time of mass production, and includes the optical axis of a reflector for a reflector symmetrical with a revolution.

[0040] Since there is a problem that the margin to heat-resistant temperature is lost, as an ingredient of a reflector even if the margin to heat-resistant temperature is lost with the focal distance of 4mm or less and input power exceeds 250W as stated previously when using one kind of heat-resistant organic material, it is desirable to use the extra-high pressure mercury lamp which made input power less than [ 250W ], and a focal distance combining the reflector set to 4mm or more. Inter-electrode distance of the arc tube of an extra-high pressure mercury lamp is set to 1.8mm or less so that it may mention later. When exceeding 1.8mm, luminous efficiency falls.

[0041] Drawing 8 shows the activity gestalt in the case of using the reflector of this invention shown in drawing 7 as the light source of optical instruments, such as actual liquid crystal projector equipment and an overhead projector. The fan 10 for cooling can be installed in the underside of the light equipment for projection, and cooling effectiveness can be further raised by spraying a wind on the reflectors 7g and 7h which prepared the fin for heat dissipation. Moreover, the flow of air may be made from sucking out the air of the light source circumference warmed by switching on the light as other approaches, and you may cool. Although the directions

of a radiation fin differ by drawing 3 , drawing 5 , and drawing 6 , drawing 7 and drawing 8 , when mounted in a projection mold image display unit as the light source for projection equipments, it stands to reason that a radiation fin is prepared so that it may become parallel to the flow of the wind generated by the fan for cooling, consequently it can radiate heat very efficiently.

[0042] Next, from drawing 23 to drawing 28 is explained using the 3rd operation gestalt which trichotomized the reflector. In addition, in drawing from drawing 23 to drawing 28 , the same sign is given to the part same to the forward release of drawing, and the explanation is omitted.

[0043] Drawing 23 is the exploded view which trichotomized the reflector. A reflector consists of 1st reflector 7p of the diameter of a header using the heat-resisting glass by the side of the reflector base close to the arc tube which is a heat source (heat deflection temperature of about 500-600 degrees C), and the 2nd reflector 7q and 7s using the heat-resistant organic material as a base material which is separated from the bulb of an arc tube in the direction of luminous radiation in drawing 23 . The 2nd reflector 7q and 7s is what divided the opening side of a reflector into two at the flat surface including the optical axis of a reflector, it is constituted by the symmetry and metal thin films, such as aluminum, silver, or a silver alloy, are given to the reflector. The optical multilayer which changes from TiO<sub>2</sub> and SiO<sub>2</sub> which were mentioned above to the reflector of 1st reflector 7p is given.

[0044] The pawl 56 is formed near [ the ] the parting plane, and, as for 2nd reflector 7q, the projection 57 is formed in the location corresponding to the pawl 56 near the parting plane 2nd reflector 7s. And the 2nd reflector 7p and 7q is assembled by fitting of a pawl 56 and projection 57. Near the parting plane of reflector [ 2nd /q / 7 / and 7s ] another side which is not illustrated, projection 57 is formed in 2nd reflector 7q, a pawl 56 is formed in reverse at 2nd reflector 7s, and this gets down, and it is constituted so that it may become symmetrical.

[0045] Furthermore, it equips each the 2nd reflector 7q and 7s with two bosses 54 for immobilization for combining 1st reflector 7p. In order to attach 1st reflector 7p in the 2nd reflector 7q and 7s, fixing metal A53 is used. As for fixing metal A53, hole 53c is formed in the center. Moreover, baffle-plate of four sheets 53b tabular four springs sections 53a which is the elastic member which inclined in the direction of a reflector opening side center, and this spring section 53a of whose are the plate-like part material which inclined to hard flow is prepared in the surrounding ring section. Four springs sections 53a and baffle-plate of four sheets 53b are attached by turns along with the circumferencial direction of the ring section, respectively. And the pars basilaris ossis occipitalis of 1st reflector 7p is inserted in hole 53c of the center of fixing metal A53, and reflector 7p is suppressed by the spring nature which four springs sections 53a of fixing metal A53 has. Furthermore, it can fix to the boss 54 for immobilization with a screw 55, press immobilization of the 1st reflector 7p can be carried out at the 2nd reflector 7q and 7s, and it can assemble to one reflector. About spring section 53a, it mentions later in drawing 2727 (a). Moreover, the 2nd reflector 7q and 7s has a slot 60, and can put and hold front sheet glass 9 into this slot 60.

[0046] As for the 2nd reflector 7q and 7s, the semi-cylindrical shape-like depression is formed in the parting plane. A reflector [ 2nd /q / 7 / and 7s ] parting plane is put between the crevice body of an insulating sleeve 51, and this can fix an insulating sleeve 51, as shown to an arc tube 1 (lamp) in the sectional view of the insulating sleeve of drawing 24 which it is for putting the power line which consists of an insulating sleeve 51 of the spool configuration which insulates it with the lead wire (not shown) for supplying power. Since the 2nd reflector 7q and 7s has given the metal thin film to the reflector, it needs to insulate the lead wire (not shown) of a lamp, and it insulates it through the lead wire (not shown) of a lamp in the hole of an insulating sleeve 51. It stands to reason that an insulating sleeve 51 becomes unnecessary when not a metallic reflection thin film but the optical multilayer is given to the 2nd reflector 7q and 7s as reflective film. In addition, in drawing 23 , 58 is a boss for lamp base mounting who fixes the lamp base to a reflector, and 59 is a boss for lead-wire immobilization.

[0047] As mentioned above, an assembly can constitute a very easy reflector, using heat-resisting glass for 1st reflector 7p by the side of the reflector base close to an arc tube, and attaining thermal resistance, since a good moldability is obtained also in a complicated appearance configuration by using the heat-resistant organic material mentioned above in the

reflector [ 2nd /q / 7 / and 7s ] base material. Moreover, by making 7s into a symmetrical configuration with 2nd reflector 7q, communalization of metal mold is attained and effectiveness is in the cost reduction at the time of mass production.

[0048] Drawing 25 is the light source assembled using the trichotomy reflector shown by drawing 23. As shown in drawing 25, the lead wire 52 for electric power supplies connected to the opposite hand is pulled out from the hole of an insulating sleeve 51 in the mouthpiece 6 of a lamp. metal terminal 52a which has a hole at the head of lead wire 52 -- welding -- or the pressure welding is carried out. Moreover, one side is connected to the power source which is not illustrated by housing 61a, metal terminal 61b to which a hole has another side at a head is welding or two lead wire by which the pressure welding was carried out, and is fixed to a mouthpiece 6 with a nut 62 by metal terminal 61b, and the power-source connector 61 which supplies power to the light source is connected for one side of lead wire. Moreover, it is fixed to the boss 59 for lead-wire immobilization with a screw 63 with metal terminal 52a of lead wire 52 by metal terminal 61b, and the lead wire of another side is connected to another side of a lamp. thus, drawing 26 shows by constituting -- as -- lead wire 52 -- an insulating sleeve 51 -- one of the two of through and lead wire 52 -- metal terminal 52a -- welding -- or a pressure welding is carried out and another side is made as for welding or the preparatory work which carries out a pressure welding to a lamp in a lamp simple substance. For this reason, it is not necessary to form the lead-wire metallic ornaments 19 for junction like before. furthermore, the inside of an assembly process -- lead wire -- welding -- or it is not necessary to carry out a pressure welding, and an assembly becomes easy.

[0049] Furthermore, when peeling of the reflective film arises according to a certain cause in breakage of a lamp, or 1st reflector 7p, the 2nd reflector 7q and 7s is continued as it is, and since it is usable, only a lamp as shown in reflector 7p made from heat-resisting glass and drawing 26 can be exchanged. Therefore, it also has the effectiveness of excelling in serviceability. This is because assembly and decomposition with 1st reflector 7p and the 2nd reflector 7q and 7s are free at fixing metal A53 and anchoring and removal are free also for the insulating sleeve 51 which let the lead wire 52 welded to the arc tube (lamp), and lead wire 52 pass at fitting of a pawl 56 and projection 57. In addition, since the lamp has fixed into cement 8 to 1st reflector 7p, it is necessary to exchange a lamp and 1st reflector 7p simultaneously.

[0050] Drawing 27 is drawing explaining how to fix 1st reflector 7p made from heat-resisting glass in the light source of drawing 25 to the 2nd reflector 7q and 7s which used the heat-resistant low heat-resistant organic material for the base material from heat-resisting glass. (b) of drawing 27 R> 7 is drawing having expanded and shown the light source of drawing 25, and (a) of drawing 27 R> 7 is drawing having expanded and shown the part surrounded with a circle [ of (b) / A ]. As (a) of drawing 27 shows, 1st reflector 7p has two or more semi-sphere-like projections 64, and the 2nd reflector 7q and 7s has the hole 65 which is a semi-sphere-like crater in the location corresponding to this projection 64. And while carrying out alignment by carrying out fitting of these projections 64 and holes 65, point contact of 1st reflector 7p and the 2nd reflector 7q and 7s is carried out. Thereby, a 1st reflector 7p and reflector [ 2nd /q / 7 / and 7s ] touch area is made small, and it is considering as the configuration which reduces reflector [ with low temperature / 2nd /q / 7 / and 7s ] heat conduction from 1st reflector 7p with high temperature. Therefore, the margin of the allowable temperature of a reflector [ 2nd /q / 7 / and 7s ] base material and the heat-resistant organic material used can be enlarged. In addition, the number of the holes 65 corresponding to projection 64 and this has three desirable pieces. It is because stable contact is securable if it is three pieces. Moreover, the clearance t between 1st reflector 7p and the 2nd reflector 7q and 7s is carried out to from 0.05mm to 2mm(s). While preparing a clearance between 1st reflector 7p and the 2nd reflector 7q and 7s and reducing heat conduction from 1st reflector 7p to the 2nd reflector 7q and 7s by the air space of a clearance, the convection heat inside the light source is made to emit from this gap. If Clearance t is enlarged, heat conduction can be reduced, but since the light from the light source leaks, 2mm or less of a clearance is desirable.

[0051] Spring section 53a shown by drawing 23 and drawing 25 is expanded intelligibly, and is shown in (a) of drawing 27. By the spring nature which the tabular piece of a plate which forms

spring section 53a has, 1st reflector 7p is pressed to the 1st reflector 7q and 7s, and it is fixing. In addition, it cannot be overemphasized that the fixed approach shown by drawing 27 is applicable also to drawing 3 and the 1st operation gestalt shown by 4.

[0052] Next, the function which baffle-plate 53b of fixing metal A53 has is explained using drawing 28. From a slanting tooth back, drawing 28 omits the power-source connector 61, and shows the light source of drawing 25 R> 5. a clearance is made by baffle-plate 53b between the outer walls of 1st reflector 7p so that clearly [ in drawing 28 ] -- as -- a mouthpiece -- it inclines in the direction. In order to cool the light source, when exhausting [ of the light source ] by the fan for cooling (not shown) from a tooth back, as an arrow head shows, air can flow the clearance between 1st reflector 7p and baffle-plate 53b, and 1st reflector 7p with high temperature can be cooled efficiently.

[0053] The 4th operation gestalt is shown in drawing 29. Drawing 29 divides RAMPUBE-SU into the reflector q of drawing 25, and 7s two, and unifies and fabricates. In drawing 29, 2nd reflector 7t is what unified and fabricated one side of RAMPUBE-SU divided into two to the 2nd reflector q of drawing 25, and 2nd reflector 7u unifies and fabricates another side of RAMPUBE-SU divided into two to the 2nd reflector s of drawing 25. Thus, components mark can be reduced by unifying and fabricating RAMPUBE-SU to a reflector. Also with the gestalt of this operation, the 2nd reflector 7t and 7u is symmetrical. In addition, in drawing 29, the power-source connector 61 is omitted and shown, and the same sign is given to the part same to the forward release of drawing, and the explanation is omitted.

[0054] Generally, as shown in drawing 30, anchoring and the light source 41 are stored in RAMPUBE-SU 70, and the light source stores mounting beam RAMPUBE-SU 70 in RAMPUBE-SU 83 for the light source 41, and contains RAMPUBE-SU 83 to a lamp house 81 further. A lamp house 81 is equipped with the fan 10 for cooling who exhausts at a tooth back and cools the light source, and has an inlet port 82 on a different wall surface from the direction of outgoing radiation of the light source. Thus, the combined lamp house is built into the projection mold image display unit, and it has come to be able to perform exchange of the light source by the user or the serviceman. RAMPUBE-SU 83 has an inlet port 86 in the location corresponding to an inlet port 82 for an exhaust port 85 at the tooth back by the side of the fan 10 for cooling. 84 is a RAMPUBE-SU hand hold, and when taking out RAMPUBE-SU 85, it is used.

[0055] Although RAMPUBE-SU was not able to be united with the reflector since the reflector was conventionally made using heat-resisting glass According to this invention, as the light source of drawing 25 described further using the heat-resistant organic material with easy shaping as a base material by the side of opening of a reflector By that in which the temperature of RAMPUBE-SU attached in the reflector by the side of opening by being made to make the opening side of a reflector the base side of a reflector into point contact also falls (ordinary temperature before or after 100 degrees C) RAMPUBE-SU divided into two can be unified and fabricated to the 1st reflector 7q and 7s by the side of opening divided into two. The gestalt of this operation is an operation gestalt of drawing 29 described previously.

[0056] Next, the 5th operation gestalt is shown in drawing 31. Drawing 31 is drawing explaining the approach which does not use fixing metal A53 for the combination of the RAMPUBE-SU unification reflectors 7v and 7w by the side of opening, and 1st reflector 7p by the side of a pars basilaris ossis occipitalis, but is fixed by the pawl. In drawing 31, the 2nd reflector 7v and 7w by the side of opening is fabricated so that it may have two or more (drawing two pieces each) pawls 67 which fix 1st reflector 7p by the side of a pars basilaris ossis occipitalis, and it fixes 1st reflector 7p by this pawl 67. By doing in this way, since fixing metal A53 can be lost, and a cost cut can be aimed at and a screw bundle is lost, there is effectiveness which does not need to have a driver for screw bundles and can also simplify assembly manday. In addition, in drawing 31, the same sign is given to the part same to the forward release of drawing, and the explanation is omitted.

[0057] Although the fin for heat dissipation as shown in the reflector section which used the heat-resistant organic material for the base material by drawing 3, drawing 5, drawing 6, and drawing 7 is not prepared with the operation gestalt stated by drawing, drawing 29, and drawing 31 R> 1 from drawing 23 to drawing 28, it is not limited to this and naturally the fin for heat



dissipation may be prepared.

[0058] Although the operation (1st reflector [ made from heat-resisting glass ] and 2nd reflector formed with heat-resistant organic material carried out 2 \*\*\*\*s in respect of including optical axis) gestalt which uses from drawing 23 to drawing 31 , and trichotomizes a reflector was described, it is limited to this and is not a thing. Probably, 2 or more \*\*\*\*s, for example, you may quadrisect, will be clear at the flat surface which includes the optical axis of a reflector reflector symmetrical with a revolution for the reflector opening side which uses a heat-resistant organic material for a base material. Share-ization of metal mold can be performed by doing in this way. Moreover, naturally the reflector base side of heat-resisting glass may also be divided into 2 or more \*\*\*\*s at a flat surface including the optical axis of a reflector reflector.

[0059] Although a heat-resistant organic material can prepare the fin for heat dissipation, can enlarge a heat sinking plane product and can raise the heat dissipation engine performance to the reflector outer wall which used the heat-resistant organic material for the base material since a good moldability is obtained also in a complicated appearance configuration as already stated, it should just prepare irregularity (it is detailed) in the front face of a reflector outer wall as an option which enlarges a heat sinking plane product. This approach has an advantage applicable not only to the 1st reflector outer wall which used the heat-resistant organic material but the outer wall of the 2nd reflector formed with heat resisting glass.

[0060] The approach of transplanting hair by electrostatic coating is also in the reflector outer wall using the heat-resistant organic material as other approaches of enlarging a heat sinking plane product. While a diameter can enlarge surface area when die length sprays a 0.1 to 0.3mm synthetic fiber on the reflector outer wall using a heat-resistant organic material by electrostatic coating by 30 to 50 micrometers, and being able to improve the heat dissipation engine performance, it is effective in the ability to reduce risk of burning oneself, even if a hand touches on hair transplantation of an outer wall, since an air space is made between hair transplantation.

[0061] The approach of reducing the improvement in the heat dissipation engine performance and the risk of a burn by the hair transplantation described here is applicable to other locations where temperature is high. For example, since temperature is high, in order to improve heat dissipation, the interior of RAMPUKE-SU 83 (product made from plastics) which stores the light source shown by drawing 30 transplants hair to a wall, increases the surface area of a wall, and raises the heat dissipation engine performance. Moreover, in the case of lamp replacement, even if a hand transplants hair and touches accidentally the RAMPUKE-SU external wall surface in which the RAMPUKE-SU hand hold 84 used when taking out RAMPUKE-SU 83 from a lamp house 81 was attached, the risk of a burn can be reduced.

[0062] Next, the predominance of the internal-surface (reflector) configuration of the reflector 7 more than containing the 4th high order multiplier is explained. Z (r) shown by several 1 sets the Z-axis as the direction (shaft of a lamp bulb) which goes to opening from the base of a reflector, and expresses the height of the reflector side when taking radial [ of a reflector ] on r shaft so that drawing 18 explaining the definition of a lens configuration may see. r shows a radial distance, RD shows radius of curvature here, RD, CC, AE, AF, AG, AH, —, A express the constant of arbitration, and n expresses the natural number of arbitration. Therefore, if each multiplier, such as CC, AE, AF, AG, and AH, is given, according to several 1, the height of a reflector side, i.e., the configuration of a reflector, will become settled.

[0063]

[Equation 1]

$$Z(r) = (1/RD) \cdot r^2 \cdot \left[ 1 + \sqrt{1 - (1 + CC) \cdot r^2 \cdot (1/RD)^2} \right] \\ + AE \cdot r^4 + AF \cdot r^6 + AG \cdot r^8 + AH \cdot r^{10} + \dots + A \cdot r^n$$

—— (数1)

[0064] In above several 1, when the cross-section configuration which shows the reflector configuration of the conventional reflector is a circle, CC=0 is given only by RD, as for a parabola, RD is given, and the case of 0<CC can define an ellipse symmetrical with the revolution to a minor axis for an ellipse with the case symmetrical [ CC=-1 and an ellipse ] with the



revolution to a major axis where RD is given and the value of CC is  $-1 < CC < 0$ .

[0065] On the other hand, since a high configuration precision is acquired easily, even if the reflector of this invention becomes a complicated configuration more than containing the 4th high order multiplier shown in several 1, it can acquire a highly precise reflector.

[0066] Drawing 4 is the reflector 7 which consisted of reflector section 7b which the cross-section configuration of a reflector becomes from reflector partial 7a made from heat-resisting glass which is a part of parabola, and a heat-resistant organic material, and the block diagram showing the condition of having joined the mouthpiece 6 of the bulb of an arc tube 1 with cement 8, as mentioned above. Moreover, drawing 12 is the block diagram of 2 division reflector showing the condition that the cross-section configuration of a reflector joined reflector 7k of a circle to reflector 7j of an ellipse, and the cross-section configuration of the reflector mentioned above joined the mouthpiece 6 of the bulb of an arc tube 1 to reflector 7j with cement. In drawing 4 and drawing 12, the same sign is given to the same part as drawing 1, and explanation is omitted.

[0067] Although any reflector configuration is designed conventionally, assuming the source of luminescence to be the point light source, the actual light source has the dimension of finite length with not the point light source but energy distribution, and it has unsymmetrical luminous-intensity-distribution distribution.

[0068] An example is shown below. The enlarged drawing near the bulb of the alternating current actuation extra-high pressure mercury lamp used for the light source for projection equipments which showed drawing 13 by drawing 1, and drawing 14 are the luminescence energy distribution maps at the time of lamp burning. In drawing 13, the electrode 2 of a couple exists in the interior of the arc tube 1 made from quartz glass, the inter-electrode gap (arc length) of finite length exists in it, and it is 1.0mm - about 1.4mm in the bulb of 100W class. moreover, it is shown in drawing 14 -- like -- etc. -- if a luminescence energy closed contour, such as connecting a luminescence energy point continuously and being obtained, turns into a luminescence energy closed contour, such as having centered on each electrodes a and b, near [ two ] the electrode (a and b show) and keeps away from Electrodes a and b, it is a luminescence energy closed contour, such as surrounding including Electrodes a and b. In addition, c and d show the low part of luminescence energy by drawing 14. From now on, the luminescence energy distribution near the bulb at the time of lamp burning is not equal, and it will turn out that it is the brightest near [ two ] the electrode so that clearly. That is, it turns out that there are two points emitting light.

[0069] The luminous-intensity-distribution property of a direct-current actuation extra-high pressure mercury lamp is shown in drawing 15, and the luminous-intensity-distribution property of an alternating current actuation extra-high pressure mercury lamp is shown in drawing 16. a lamp shaft (from 0 degree to 180 degrees in drawing) and the luminous-intensity-distribution property of an arc tube 1 cross at right angles, as shown in drawing 15 and drawing 16 -- it receives a shaft (from 90 degrees to 270 degrees in drawing), and is unsymmetrical. The luminous-intensity-distribution property of the extra-high pressure mercury lamp of the direct-current actuation shown especially in drawing 15 has large asymmetry compared with the luminous-intensity-distribution property of the extra-high pressure mercury lamp of the alternating current actuation shown in drawing 16. This reason is because, as for the extra-high pressure mercury lamp of direct-current actuation, a part of light is generally shaded at a light and anode plate side since the electrode dimension of an anode plate is larger than the electrode dimension of cathode.

[0070] As stated above, as for the reflector which it is considered that the present extra-high pressure mercury lamp has not the point light source but the two light sources, and is used combining an extra-high pressure mercury lamp, it is desirable to consider as the configuration from which a focus turns into two or more points. In order to make the focus of a reflector into two or more points, it becomes indispensable to have the 4th high order more than multiplier in the above (several 1). In addition, when the arc length exceeds 1.8mm, effectiveness falls on the contrary.

[0071] As mentioned above, according to this invention, although a predominance at the time of making the internal surface (reflector) of a reflector into the configuration more than containing

the 4th high order multiplier was described, since the reflector configuration of the highly precise reflector near a design configuration can be acquired to stability, it becomes possible to make the internal surface (reflector) of a reflector into the configuration more than containing the 4th high order multiplier.

[0072] Drawing 9 and drawing 10 show other operation gestalten of this invention reflector. In drawing 9 and drawing 10, the same sign is given to the part same to the forward release of drawing, and explanation is omitted. Drawing 9 is what showed the case where the overall diameter of the reflector of reflector 7i became a larger configuration than the diameter of outgoing radiation side opening of a reflector, and is the configuration which can be enough accomplished with the multiplier corresponding to the aspheric surface type shown in several 1. It becomes realizable by considering as the reflector of the structure divided into two at the flat surface including the optical axis of a reflector also with such an inner surface configuration.

[0073] Similarly, drawing 10 shows reflector 7m which has the reflector configuration which made small the diameter of outgoing radiation side opening in consideration of the luminous intensity distribution of a reflector compared with the paraboloid reflector. It is the configuration which can be enough accomplished like the gestalt of operation of drawing 9 with the multiplier corresponding to the aspheric surface type shown in several 1. It becomes realizable by considering as the reflector of the structure divided into two at the flat surface almost parallel to the optical axis of a reflector also with such an inner surface configuration.

[0074] In addition, in drawing 9 and drawing 10, as drawing 3 and drawing 4 R> 4 described, as for each part carried out 2 \*\*\*\*s at the flat surface almost parallel to the optical axis of a reflector, it is desirable to consist of a part of the reflector using heat-resisting glass and a reflector part using a heat-resistant organic material. However, in a actual activity, as long as it comes to obtain sufficient margin to the heat deflection temperature of a heat-resistant organic material, one kind of ingredient, for example, a heat-resistant organic material, may be used for each part carried out 2 \*\*\*\*s at the flat surface almost parallel to the optical axis of a reflector.

[0075] Next, the gestalt of the operation which applied trichotomy of a reflector to drawing 9 is shown in drawing 32. the 1st of the product [ set to drawing 32 and / reflector ] made from heat-resisting glass by the side of a reflector pars basilaris ossis occipitalis -- the 2nd which used the heat-resistant organic material for reflector 7aa and the base material which divided the reflector opening side into two at the flat surface including the optical axis of a reflector -- it consists of reflector 7bb and seven cc. the 2nd -- reflector 7bb and reflector 7cc are symmetrical. it already stated -- as -- the 1st -- since the diameter of opening is a diameter of a header, although, as for reflector 7aa, it uses heat-resisting glass -- precision -- good -- it can fabricate -- moreover, the 2nd -- since reflector 7bb and seven cc of heat-resistant organic materials are used for the base material, a free sculptured surface as shown by drawing 32 with large aperture with a sufficient precision can be fabricated. the 2nd -- it unites with RAMPUBE-SU divided into two, and reflector 7bb and seven cc are fabricated -- having -- \*\*\*\* -- the 2nd -- two or more holes 67 of \*\* of the \*\* style are made in the RAMPUBE-SU section 68 near [ which narrowed towards the optical axis by the side of reflector 7bb and seven cc opening ] the field. the case where it exhausts by the fan 10 (not shown) for cooling from the back side of the light source -- a hole 67 -- passing -- the 2nd -- air can flow along reflector 7bb and a seven cc outer wall curved surface, and a reflector, i.e., the light source, can be cooled. supposing there is no hole 67 -- the 2nd -- since the flow of air does not arise in the field to which the reflector 7bb and seven cc opening side narrowed, the cooling effect in this field is low.

[0076] Even if it carries out it 2 or more \*\*\*\*s at the flat surface which includes the optical axis of the reflector of a reflector among the gestalten of this operation described above, using as a parting plane the part which shifted from the optical axis of a reflector about the structure divided into two depending on the configuration, it cannot be overemphasized that it is contained in this invention.

[0077] On the other hand, in the light source for projection equipments of this invention, the cure against a burst of an extra-high pressure mercury lamp becomes possible [ confining

scattering of the glasses for lamps and electron tubes by burst by thickening average wall thickness of a reflector gradually toward pars-basilaris-ossis-occipitalis opening from front opening ]. In order to do in this way, when the glasses for lamps and electron tubes of an arc tube explode, it is because an impact strong against the pars-basilaris-ossis-occipitalis opening side of the reflector near an arc tube is added. The minimum thickness of a reflector is required 2mm or more, and if a moldability is thought as important, it is desirable to be referred to as 3mm or more. Moreover, pars-basilaris-ossis-occipitalis opening near a bulb is good to consider as 5mm average wall thickness desirably. When bursting the lamp bulb of an arc tube in a busy condition, and there was 5mm or more of thickness of the above-mentioned reflector made from BMC, a fragment did not disperse outside.

[0078] Furthermore, in front opening, the glass front 9 for scattering prevention with which a reflector 7 differs from construction material is formed, and scattering of the glasses for lamps and electron tubes by lamp burst is prevented to an illumination-light study system to it. In both sides of this front sheet glass 9, reflection loss is mitigable by performing an acid-resisting coat.

[0079] In addition, although the antireflection film is vapor-deposited by both sides of a glass front, if the internal absorptance of said glass front exceeds 5%, since a micro crack etc. may occur in an antireflection film by the thermal expansion of a glass front at the time of a long-term activity, the matter of internal absorption small as much as possible is good. Moreover, as shown in drawing 11, it becomes possible it not only to prevent scattering of the glasses for lamps and electron tubes by lamp burst to an illumination-light study system, but to combine with the configuration of a reflector and to control the outgoing beam from a lamp by making glass front 9a into the configuration which has a lens operation to high degree of accuracy more. In addition, in drawing 11, the same sign is given to the part same to the forward release of drawing, and explanation is omitted.

[0080] Next, the property of the reflective film prepared in the reflector of a reflector is explained as an operation gestalt of this invention using drawing 17 and drawing 222. Drawing 17 is what showed the spectral energy distribution of a common extra-high pressure mercury lamp, and drawing 22 shows the permeability to the beam of light with which wavelength (nm) made it the axis of abscissa, and the reflective film made vertical incidence to the axis of ordinate.

[0081] As shown by the spectral energy distribution of drawing 17, blue spectrum strong against about 405nm exists. For this reason, it is good to make mesial magnitude (50% permeability) wavelength of UV cut-off filter of a reflector into this blue wavelength of 405nm or more. If it can do, about 410nm is desirable. Moreover, since part light energy exists also in an infrared region 800nm or more (not shown), it is good to make the property of the reflective film of a reflector as [ pass / the light of an infrared region ], to make a reflector once absorb it, and to make it radiate heat outside.

[0082] In consideration of the above thing, the reflective film property on the front face of a reflector is carried out like drawing 22. It considers as the film design which makes a beam of light with the short wavelength of 410nm or less which is a blue field mostly penetrate. Consequently, although ultraviolet rays (wavelength is 380nm or less) are directly irradiated by the thermosetting resin of the base material of a reflector, since this thermosetting resin is made to add and absorb an ultraviolet ray absorbent, it is lost that harmful ultraviolet rays leak outside from a reflector. Although the permeability property of this cut-off is excellent in the steeper one, since it leads to a cost rise, the number of film is decided in accordance with the need. As reflective film, the optical multilayer which consists of TiO<sub>2</sub> and SiO<sub>2</sub> is common, and the total of no less than 30 to 50 layers is needed. On the other hand, the beam of light of a near infrared region 800nm or more is also considered as the design passed simultaneously as a property of the reflective film of a long wavelength field. Since a heat ray (from near-infrared to infrared light) is absorbed by the reflector as a result, the temperature rise of other components contained in projection equipment is mitigated, and reinforcement becomes possible. At this time, when the color of the thermosetting resin which forms a reflector is made black, it cannot be overemphasized that the absorption of light is carried out more to a well head. In addition, it is as having mentioned above that the temperature rise by the absorbed heat ray radiates heat

effectively with the fin for heat dissipation prepared in the external wall surface of a reflector. [0083] If the vertical permeability to the beam of light from 420nm to 700nm is made to 15% or less among light fields, a reflector with high effectiveness can be obtained. Furthermore, if the permeability of the range of 420 to 680nm is made to less than 4%, compared with AL vacuum evaporation film (a spectral reflectance is almost flat at about 90% of reflection factors), the divergence flux of light from a bulb can be caught more to validity.

[0084] In the above, although reference was made as reflective film given to a reflector reflector about the optical multilayer which makes the ultraviolet rays and infrared radiation other than the light penetrate, below, a metallic reflection thin film is described. Namely, as a reflector is shown by drawing 4, it is divided and constituted at least at a reflector base and reflector opening side. When heat-resisting glass is used for a reflector base side and a heat-resistant organic material is used for a reflector opening side as a base material, as reflective film used for the reflector by the side of the base made from heat-resisting glass As reflective film of the reflector by the side of opening using a heat-resistant organic material, metal thin films, such as aluminum, silver, and a silver alloy, are used using the above-mentioned optical multilayer. The reflection factor to the wavelength of 450 to 650nm is about 98% or more, and the metallic reflection film containing especially silver has the advantage that the reflection factor to the wavelength of 650nm is higher than the reflection factor to the wavelength of 450nm. In this case, emissivity colors it the reflector by the side of opening using a heat-resistant organic material by 0.5 or less color by 0.7 or less and abbreviation. 400k. For example, it is white. When the substrate of a reflector is in sight by a certain factor by doing in this way, it can reflect so that the heat ray from a lamp may not be absorbed.

[0085] As mentioned above, although the gestalt of concrete operation of this invention was explained based on the extra-high pressure mercury lamp, it cannot be overemphasized that effectiveness with the same said of the xenon lamp excellent in \*\*\*\*\* is acquired.

[0086] Drawing 19 is drawing having shown arrangement of the illumination-light study system of a liquid crystal projector which used the light source 28 for projection equipments of this invention. In drawing 19, 20 is well-known integrator optical system (it is described as a multi-lens array below). 1st multi-lens array 20a which divides into two or more flux of lights the flux of light which carries out incidence by the lens element of two or more rectangle configurations arranged in the shape of a matrix, While expanding two or more flux of lights divided by the lens element of two or more rectangle configurations arranged in the shape of a matrix by the 1st multi-lens array, respectively and carrying out a superposition exposure on a liquid crystal panel It consists of 2nd multi-lens array 20b equipped with the polarization conversion function which carries out outgoing radiation of the desired polarization wave to two or more polarization beam splitters prepared respectively corresponding to said two or more lens elements with  $1/2\lambda$  phase contrast plate. The polarization lighting system which carries out outgoing radiation of the desired polarization wave component by the light source 40 for projection equipments and the multi-lens array 20 is formed. 31a, 31b, and 31c are the liquid crystal panels corresponding to red, green, and the blue three primary colors, respectively. 23 and 25 are the dichroic mirrors for carrying out the spectrum of the white light bundle from the light source for projection equipments to the three primary colors. 30, 28, and 26 are field lenses which specify the magnitude of the flux of light. 22 is a condenser lens for making into convergence light the flux of light which carries out incidence to a multi-lens array. 40 is the light source for projection equipments concerning this invention, it intersects perpendicularly with a lamp shaft and the radiation fin 14 is formed. Temperature control is performed so that the fan 10 for cooling may be stationed on the side face of this light source for projection equipments and it may become desired temperature. 21, 24, 27, and 29 show the photosynthesis prism which compounds the image light in which 32 modulated the reflective mirror with the liquid crystal panel corresponding to each for a light in three primary colors.

[0087] Actuation of drawing 19 is described below. Outgoing radiation of the white light bundle from the light source 40 for projection equipments is carried out as the flux of light which has a desired polarization component by the multi-lens array 20, it is reflected by the reflective mirror 21 and incidence of it is carried out to a condensing lens 22. A condensing lens 22 carries out

incidence of the flux of light divided by the multi-lens array 20 to liquid crystal panels 31a, 31b, and 31c. Since an optical path becomes long from other colored light, the colored light which carries out incidence to liquid crystal panel 31a through the reflective mirrors 27 and 29 is amended by the field lenses 26, 28, and 30. In response to light modulation, it penetrates with a video signal (not shown), color composition is carried out by the photosynthesis prism 32, and amplification projection of the colored light which carried out incidence to liquid crystal panels 31a, 31b, and 31c is carried out on a screen (not shown) with the lens 101 for projection.

[0088] Next, drawing 20 and drawing 21 are the perpendicular direction sectional views showing the body of a tooth-back projection mold image display unit which carried the projection optical system of the invention in this application, and have composition which carries out amplification projection of the image acquired in the optical unit 100 on a screen 102 through a mirror 104 by return with the lens 101 for projection. Drawing 20 shows the configuration of the cabinet 103 at the time of reducing set height, and drawing 21 shows the configuration of the cabinet 103 at the time of reducing set depth.

[0089] According to this invention the above passage, the light source for projection equipments equipped with the reflector which was highly precise, was excellent in a moldability and workability, and was excellent also in the reflection property, and projection equipment equipped with it can be obtained.

[0090]

[Effect of the Invention] According to this invention, the light source for projection equipments equipped with the reflector which was highly precise, was excellent in a moldability and workability, and was excellent also in the reflection property, and projection equipment equipped with it can be obtained.

[Translation done.]

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- 3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The sectional view of the general light source for projection equipments which made the extra-high pressure mercury lamp the source of luminescence

[Drawing 2] The plot plan having shown the activity gestalt in the case of using as the light sources for optical instruments, such as liquid crystal projector equipment

[Drawing 3] The external view showing 1 operation gestalt of the light source for projection equipments concerning this invention

[Drawing 4] The sectional view showing 1 operation gestalt of the light source for projection equipments concerning this invention

[Drawing 5] The external view showing 1 operation gestalt of the light source for projection equipments concerning this invention

[Drawing 6] The external view showing 1 operation gestalt of the light source for projection equipments concerning this invention

[Drawing 7] The external view showing 1 operation gestalt of the light source for projection equipments concerning this invention

[Drawing 8] The plot plan having shown the activity gestalt in the case of using the light source for projection equipments of this invention as the light sources for optical instruments, such as liquid crystal projector equipment

[Drawing 9] The sectional view of the light source for projection equipments by the light source lamp and reflector of this invention

[Drawing 10] The sectional view of the light source for projection equipments by the light source lamp and reflector of this invention

[Drawing 11] The sectional view of the light source for projection equipments by the light source lamp and reflector of this invention

[Drawing 12] The sectional view of the light source for projection equipments by the light source lamp and compound reflector of this invention

[Drawing 13] The expanded sectional view near the bulb of an extra-high pressure mercury lamp

[Drawing 14] The luminescence energy distribution map near the bulb at the time of extra-high-pressure-mercury-lamp burning

[Drawing 15] The luminous-intensity-distribution property of the extra-high pressure mercury lamp of direct-current actuation

[Drawing 16] The luminous-intensity-distribution property of the extra-high pressure mercury lamp of alternating current actuation

[Drawing 17] Spectral energy distribution of a common extra-high pressure mercury lamp

[Drawing 18] The explanatory view for explaining an aspheric surface configuration

[Drawing 19] The light source for projection equipments of this invention was used. Plot plan of the illumination-light study system of a liquid crystal projector

[Drawing 20] The perpendicular direction sectional view showing the body of a tooth-back projection mold image display unit which carried the projection optical system of the invention in this application

[Drawing 21] The perpendicular direction sectional view showing the body of a tooth-back

projection mold image display unit which carried the projection optical system of the invention in this application

[Drawing 22] Property drawing showing the spectral transmittance of the reflective film prepared in a reflector reflector

[Drawing 23] The exploded view which trichotomized the reflector

[Drawing 24] The sectional view of an insulating sleeve

[Drawing 25] The light source for projection equipments assembled using the trichotomy reflector shown by drawing 23

[Drawing 26] The configuration of a lamp

[Drawing 27] Drawing explaining how to fix to the 2nd reflector 7q and 7s 1st reflector 7p in the light source shown in drawing 25

[Drawing 28] Drawing having shown the light source of drawing 25 from the slanting tooth back

[Drawing 29] Drawing showing the 4th operation gestalt

[Drawing 30] Installation drawing to the projection mold image display unit of the light source

[Drawing 31] Drawing showing the 5th operation gestalt

[Drawing 32] The gestalt of the operation which applied trichotomy of a reflector to drawing 9

[Description of Notations]

1 [ -- Molybdenum foil, ] -- The arc tube made from quartz glass, 2 -- An electrode, 3 -- An electrode mandril, 4 5 [ -- Reflector, ] -- The electrode closure section, 6 -- A mouthpiece, 7, 7a-7m -- A reflector, 7p, 7q, 7s, 7t, 7u, 7v, 7w 7aa(s), 7bb -- A reflector, 8 -- 9 Cement, 9a -- Glass front, 10 [ -- Lead wire, ] -- A fan, 14-16 -- A fin, 17 -- An electrode mandril, 18 19 -- Lead-wire metallic ornaments, 20 -- A multi-lens array, 20a -- The 1st multi-lens array, 20b -- The 2nd multi-lens array, 31a, 31b, 31c -- Liquid crystal panel, 23 25 -- A dichroic mirror, 26 -- A field lens, 22 -- Condenser lens, 28 -- The light equipment for projection, 29 -- A reflective mirror, 32 -- Photosynthesis prism, 40 [ -- Lead wire, 52a / -- Metal terminal, ] -- The light source, 41 -- The light source, 51 -- An insulating sleeve, 52 53 [ -- Hole, ] -- Fixing metal A, 53a -- The spring section, 53b -- A baffle plate, 53c 54 [ -- A projection, 58 / -- The boss for RAMPUBE-SU mounting, ] -- The boss for immobilization, 55 -- A screw, 56 -- A pawl, 57 59 [ -- Housing, ] -- The boss for lead-wire immobilization, 60 -- A slot, 61 -- A power-source connector, 61a 61b [ -- A projection, 65 / -- Hole, ] -- A metal terminal, 62 -- A nut, 63 -- A screw, 64 66 [ -- RAMPUBE-SU 81 / -- Lamp house, ] -- A RAMPUBE-SU attaching hole, 67 -- A hole, 68 -- The RAMPUBE-SU section, 70 82 [ -- An exhaust port, 86 / -- An inlet port, 100 / -- An optical unit, 101 / -- The lens for projection, 104 / -- A clinch mirror, 102 / -- A screen, 103 / -- Cabinet ] -- An inlet port, 83 -- RAMPUBE-SU, 84 -- A RAMPUBE-SU hand hold, 85

[Translation done.]

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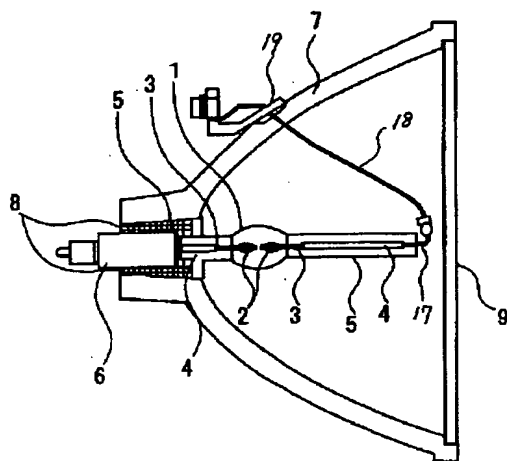
2.\*\*\*\* shows the word which can not be translated.

3.In the drawings, any words are not translated.

## DRAWINGS

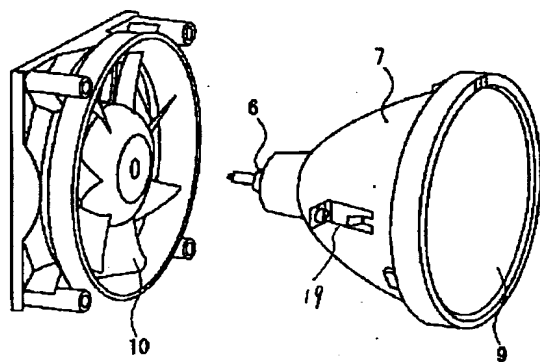
[Drawing 1]

図 1



[Drawing 2]

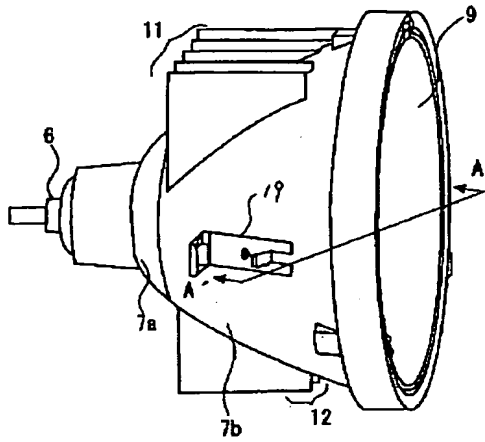
図 2



[Drawing 3]

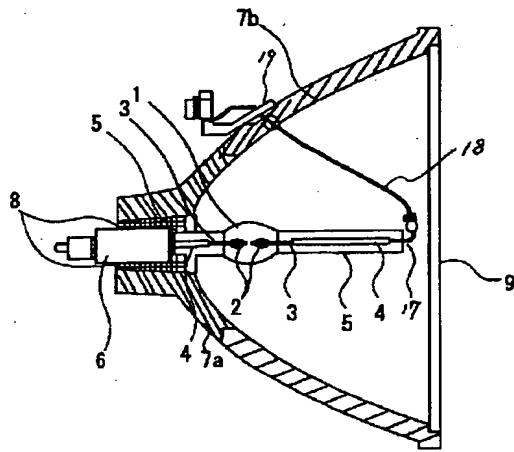


図 3



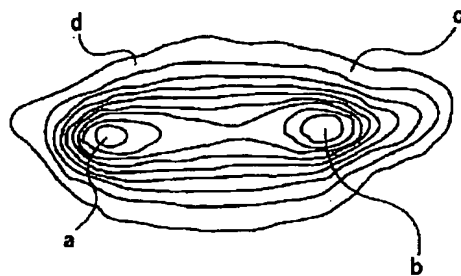
[Drawing 4]

図 4



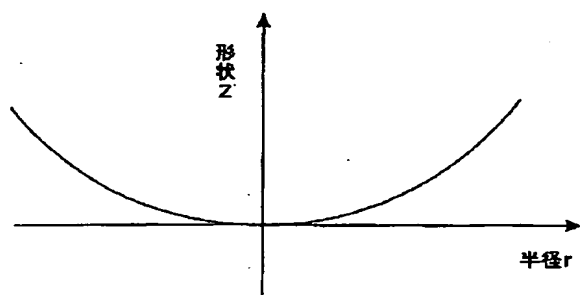
[Drawing 14]

図14



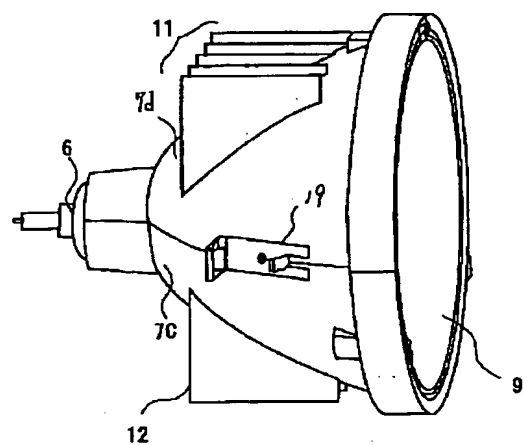
[Drawing 18]

図18



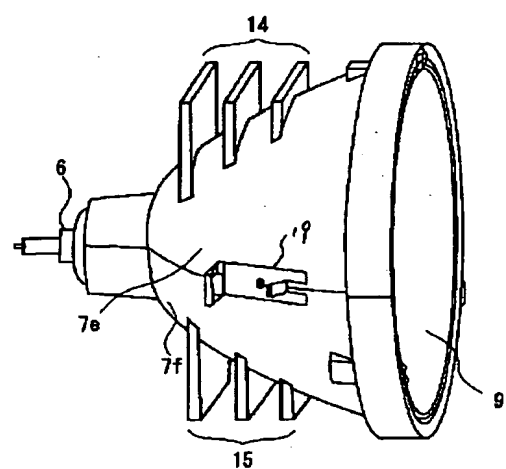
[Drawing 5]

図5



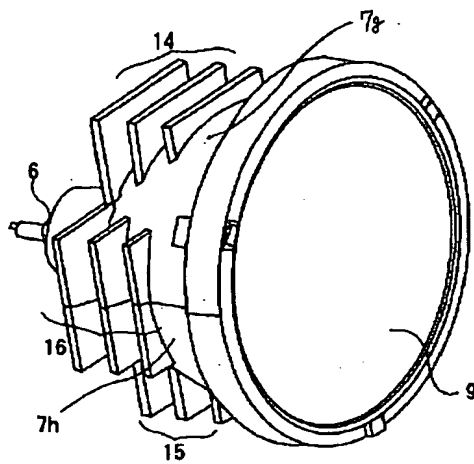
[Drawing 6]

図6



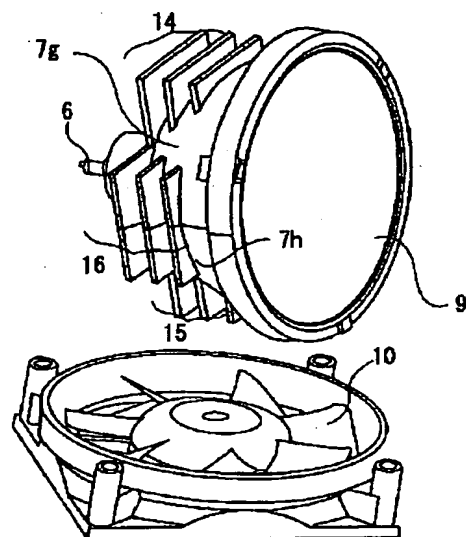
[Drawing 7]

図 7



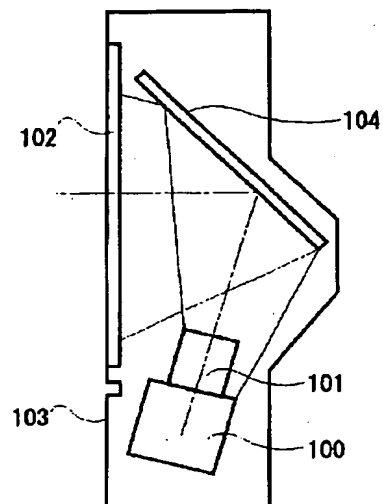
[Drawing 8]

図 8



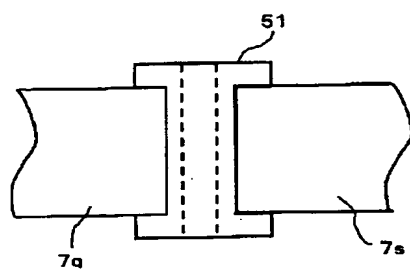
[Drawing 21]

図 21



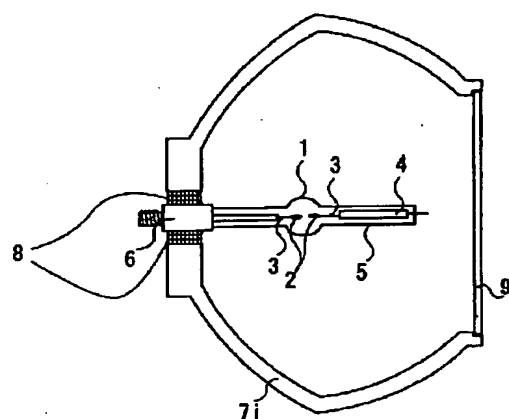
[Drawing 24]

図 24



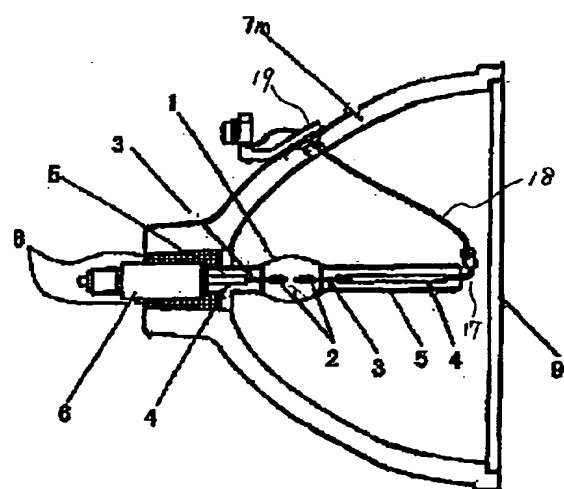
[Drawing 9]

図 9



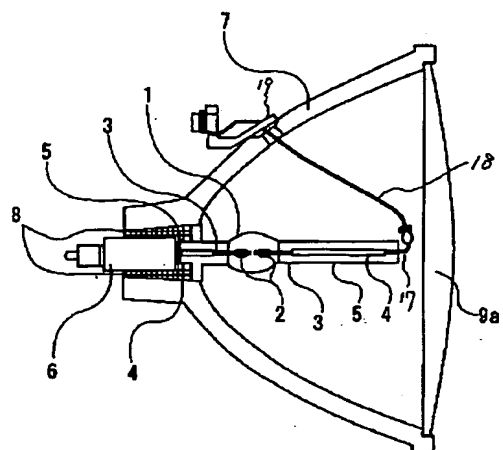
[Drawing 10]

図10



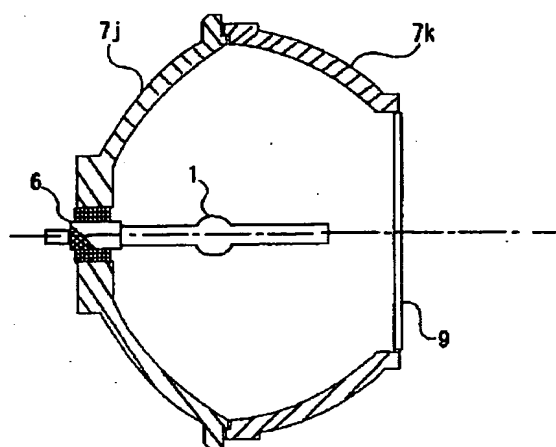
[Drawing 11]

図11



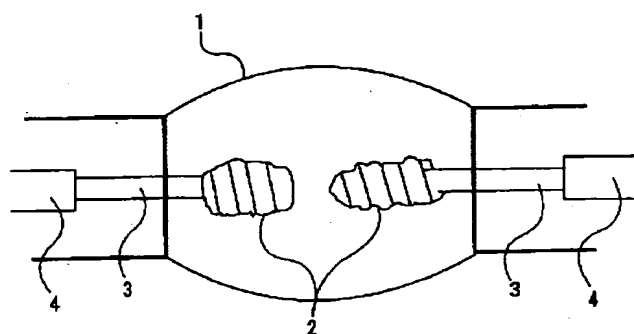
[Drawing 12]

図12



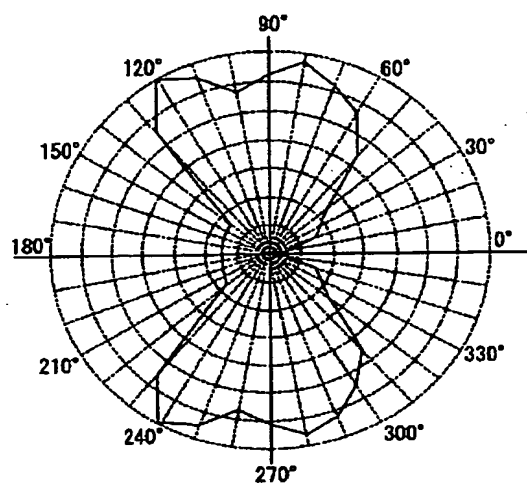
[Drawing 13]

図13



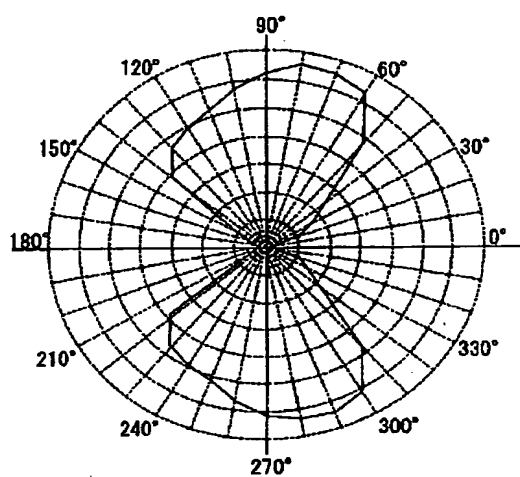
[Drawing 15]

図15



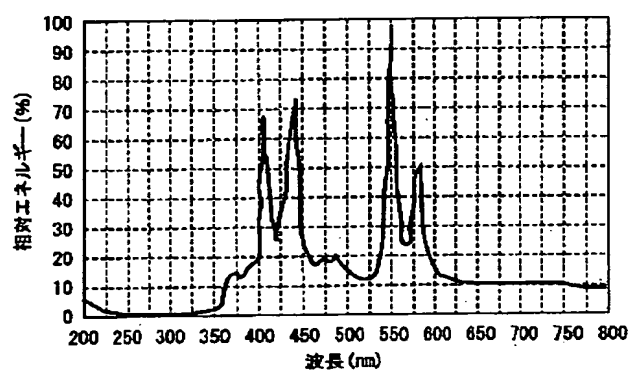
[Drawing 16]

図16



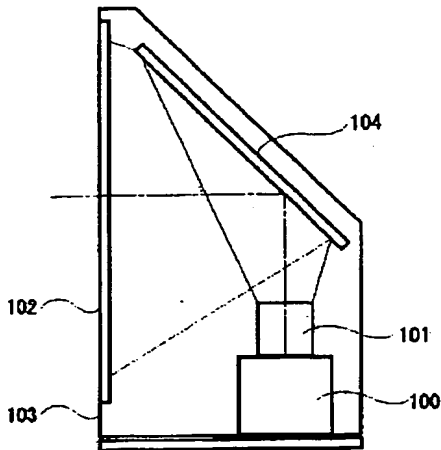
[Drawing 17]

図17



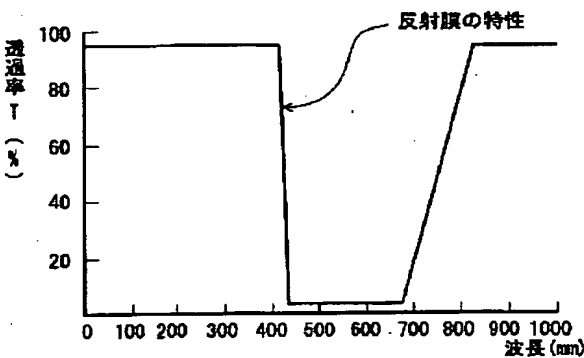
[Drawing 20]

図20



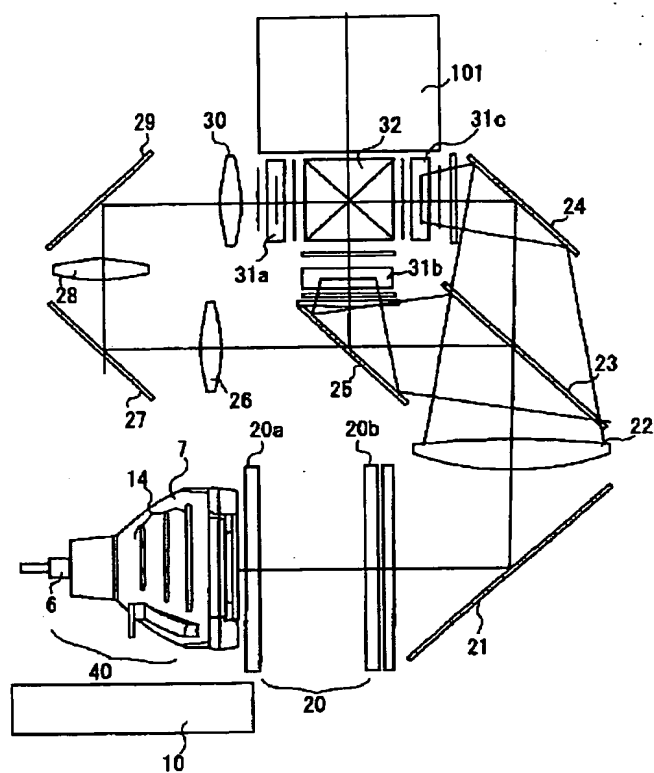
[Drawing 22]

図22



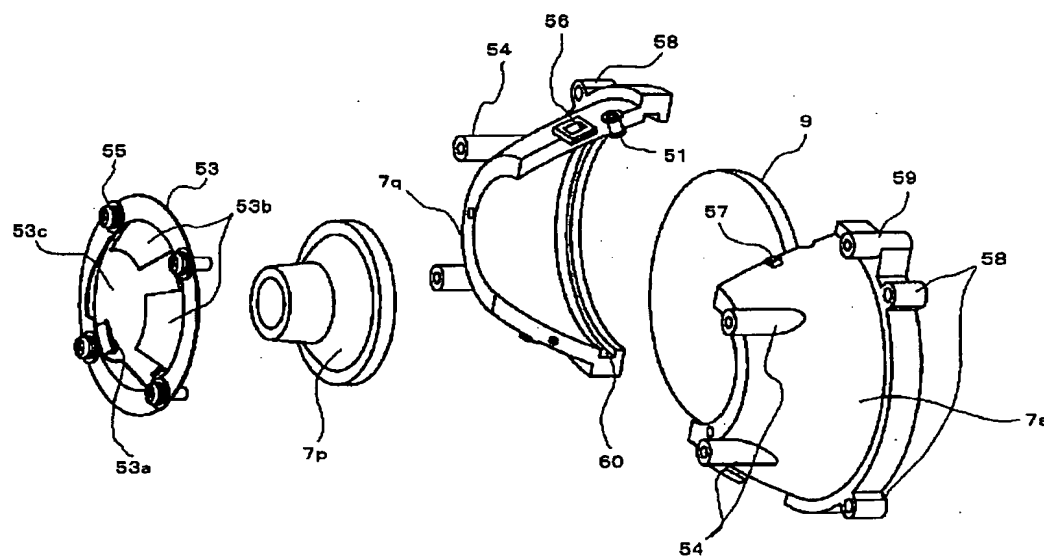
[Drawing 19]

図19



[Drawing 23]

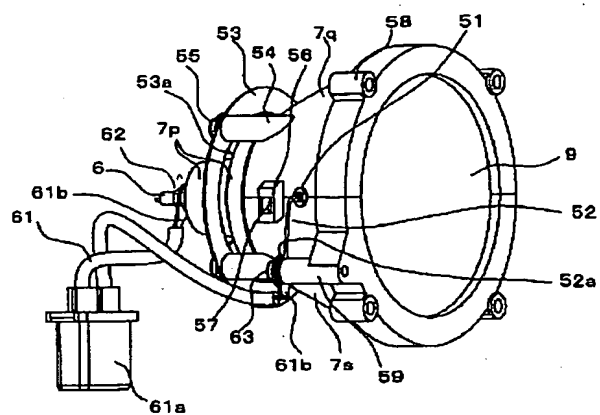
図23



[Drawing 25]

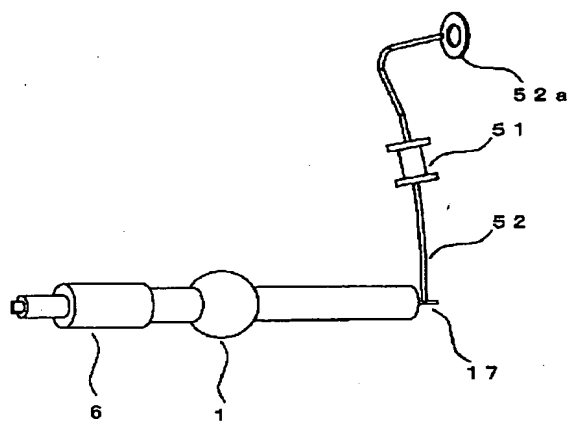


図 2 5



[Drawing 26]

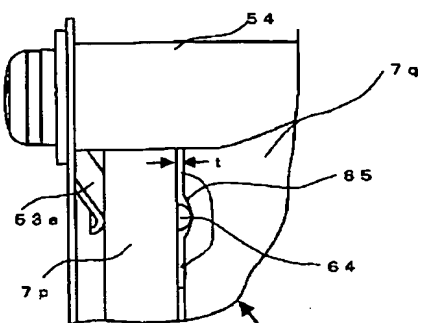
図 2 6



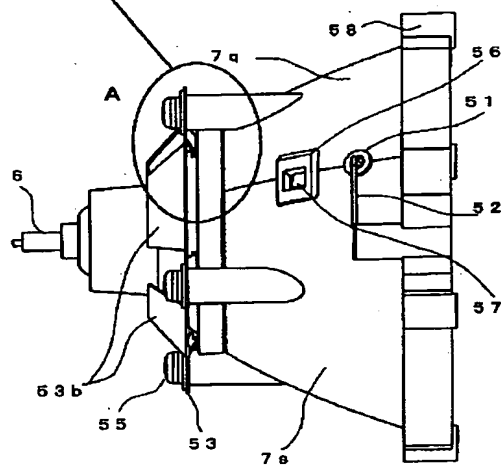
[Drawing 27]

図 27

(a)

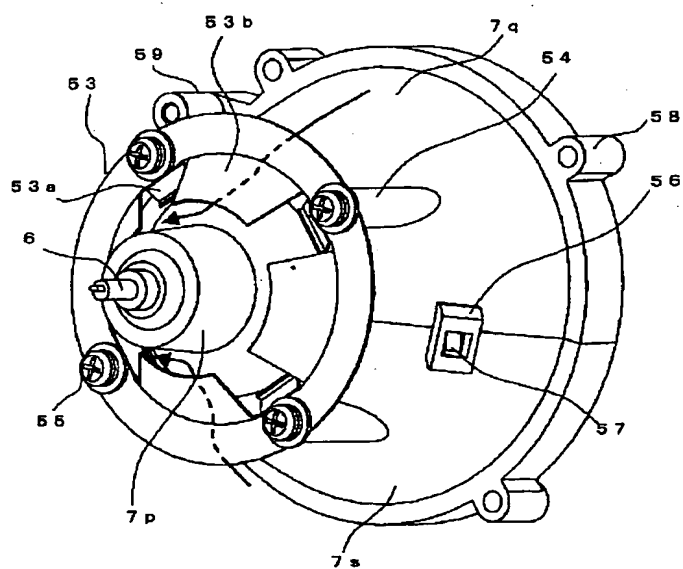


(b)



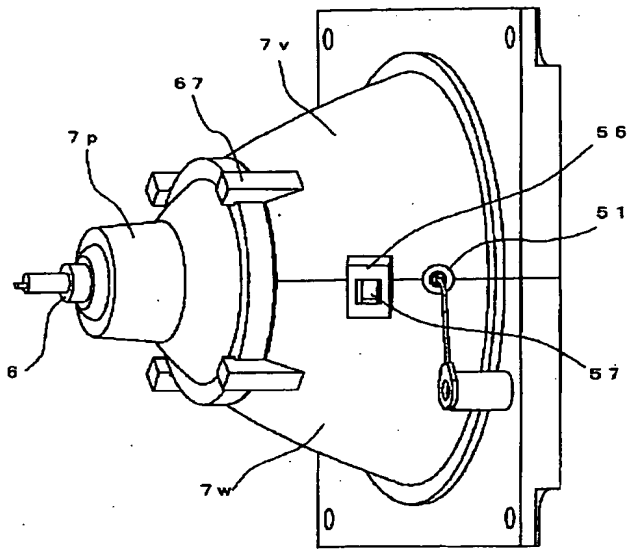
[Drawing 28]

図 28



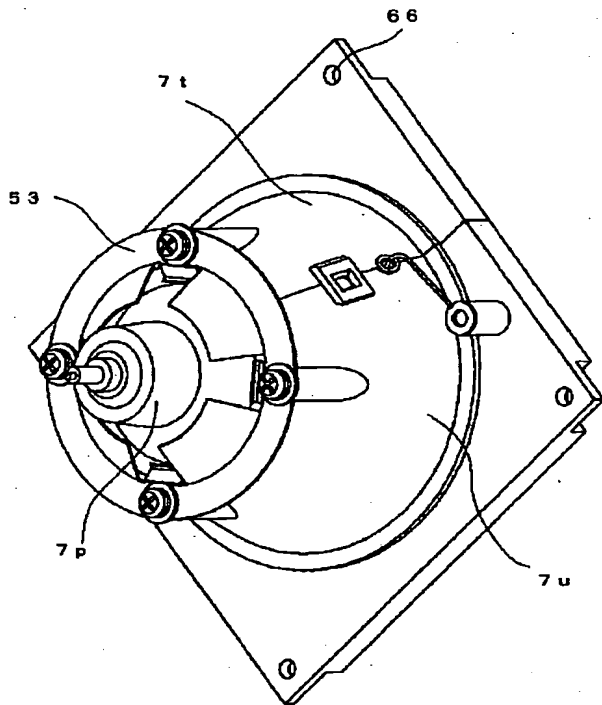
[Drawing 31]

図 31



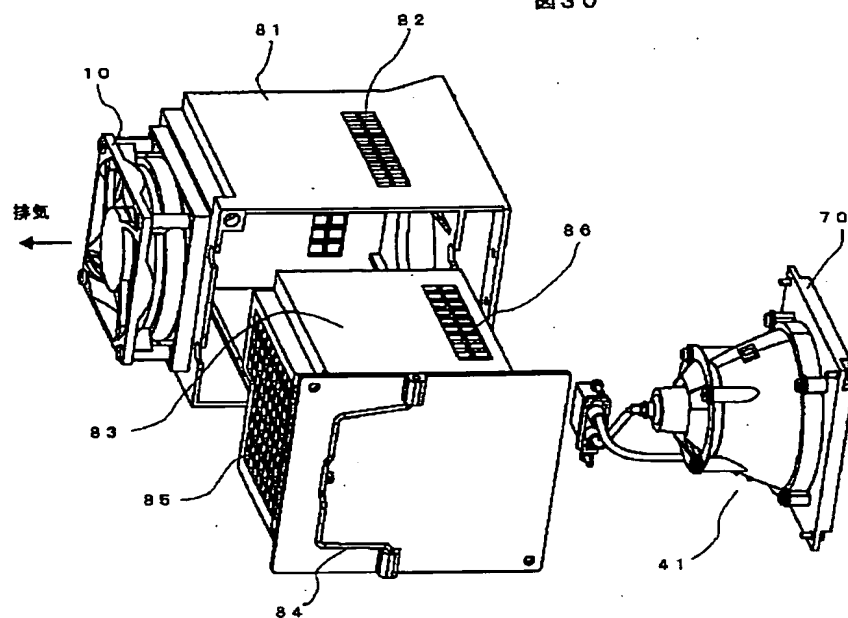
[Drawing 29]

図 29



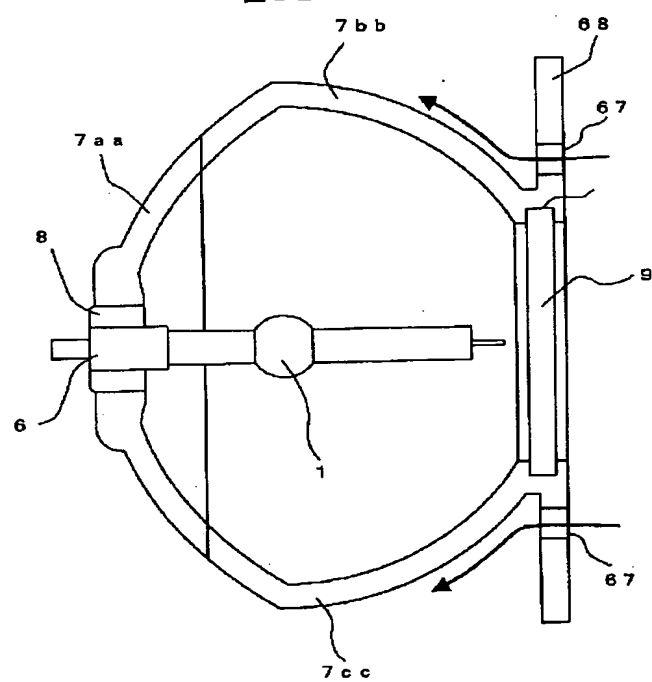
[Drawing 30]

図 30



[Drawing 32]

図 32



[Translation done.]